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Title: Case Study 2 - Hanford Am Exposure (1976)

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Case Study 2 - Hanford Am Exposure (1976)

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Actinide Operations/National Security Education Center

LA-UR-21-XXXXX

Agenda

1. Background
2. Simply Difficult Video – “Atomic Man”
 - What is accurate?
 - What is missing?
3. References
 - The 1976 Hanford Americium Accident (TID-28938/UC-48 January 1979)
 - The Atomic Man: Case Study of the Largest Recorded Am-241 Deposition in a Human (HPS 61st Annual Meeting July 2016)
 - Site of the Atomic Man Accident Torn Down (Tri-City Herald, March 31, 2017)
4. What changed as a result?
 - At the Hanford Site
 - Across the Complex
 - At Los Alamos



Background



Hanford Plutonium Finishing Plant

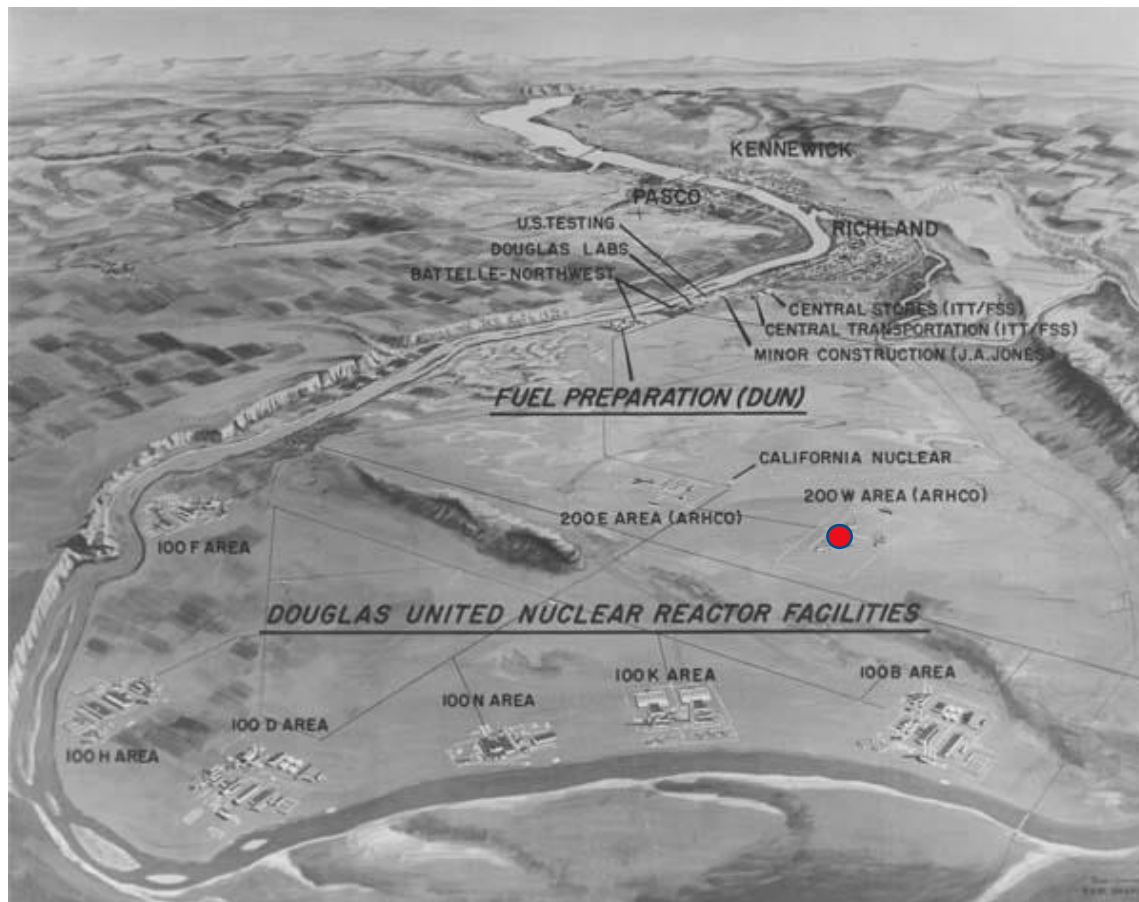
- Building 234-5Z or “Z Plant”
- Operational 1949-1989
- Cold War ongoing



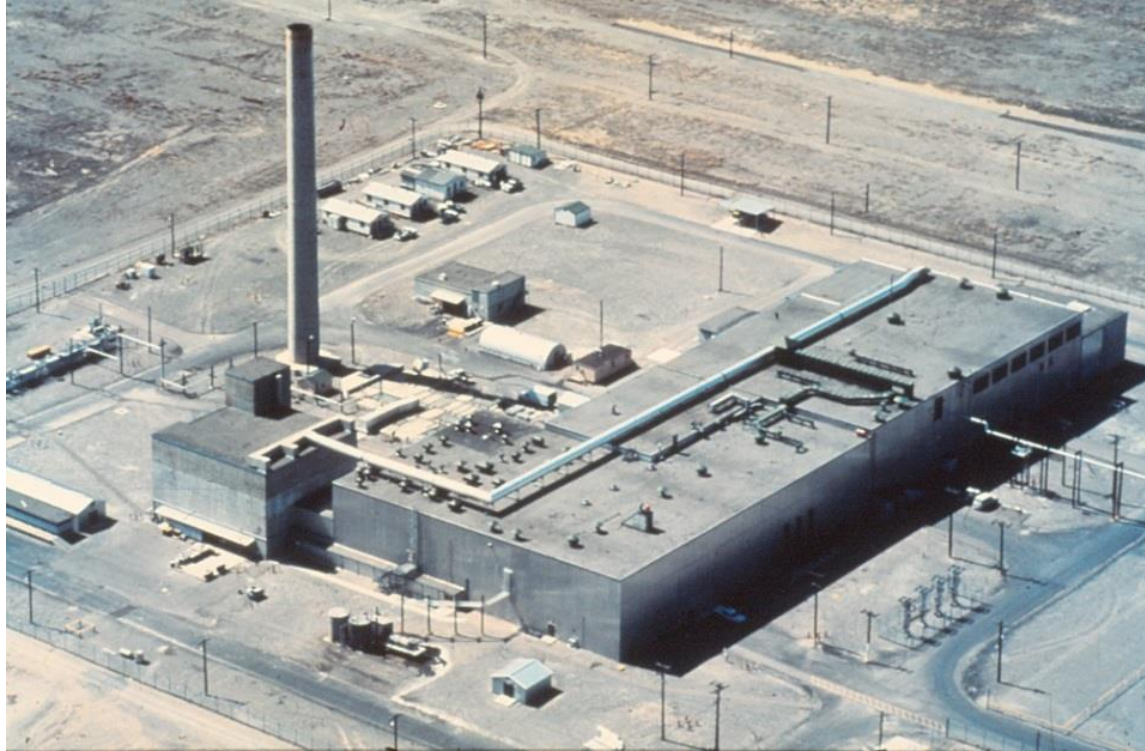


WASHINGTON





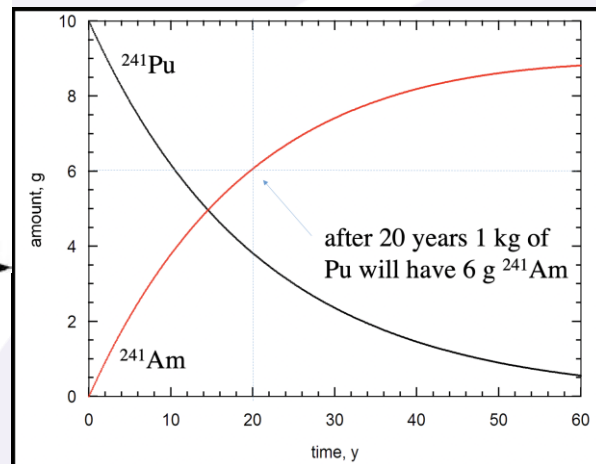
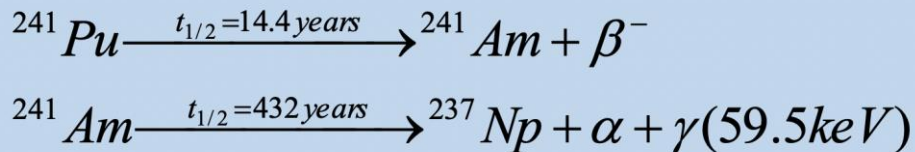
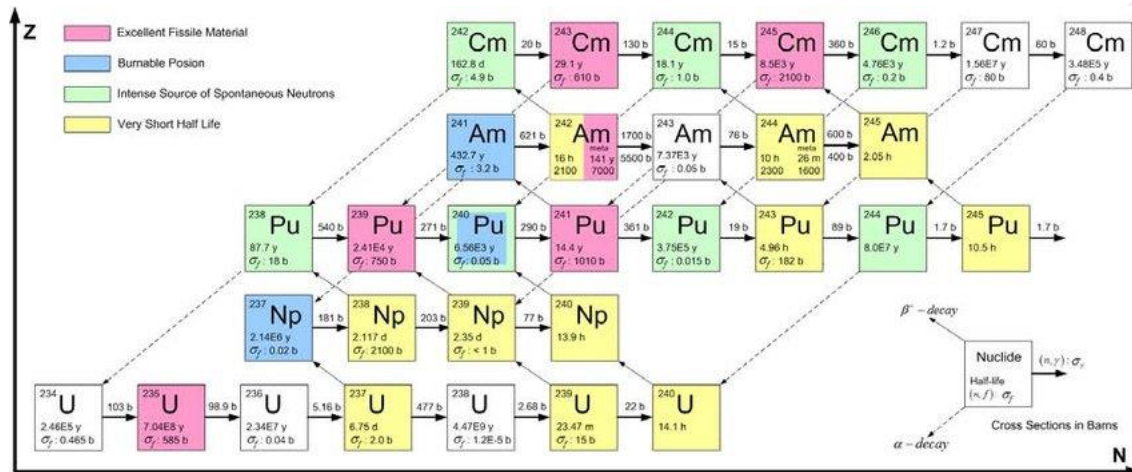
Hanford Plutonium Finishing Plant (Building 234-5Z)



McClusky room demolition (2017)



Am-241 ingrowth in weapons grade plutonium





THE WORLD'S SMALLEST SUPER-HERO!



12¢

The

ATOM

SEPT.
NO. 8

*"LOCKUP
in the LETHAL
LIGHTBULB!"*

FEATURING THE
AMAZING VILLAIN,

DR. LIGHT!

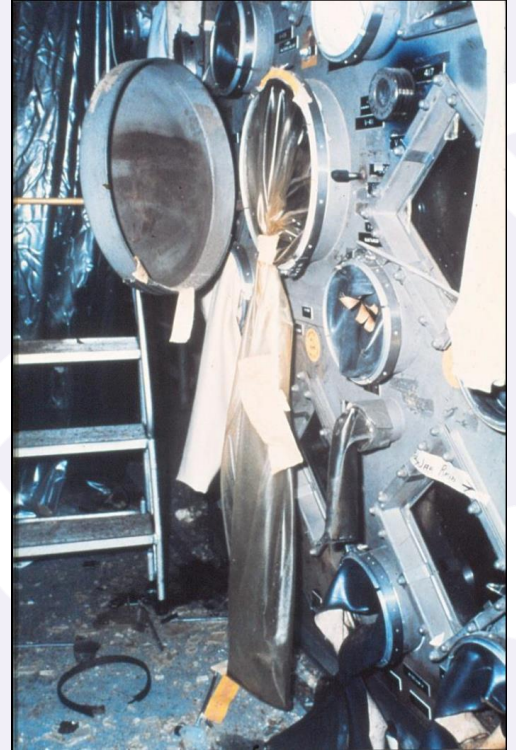
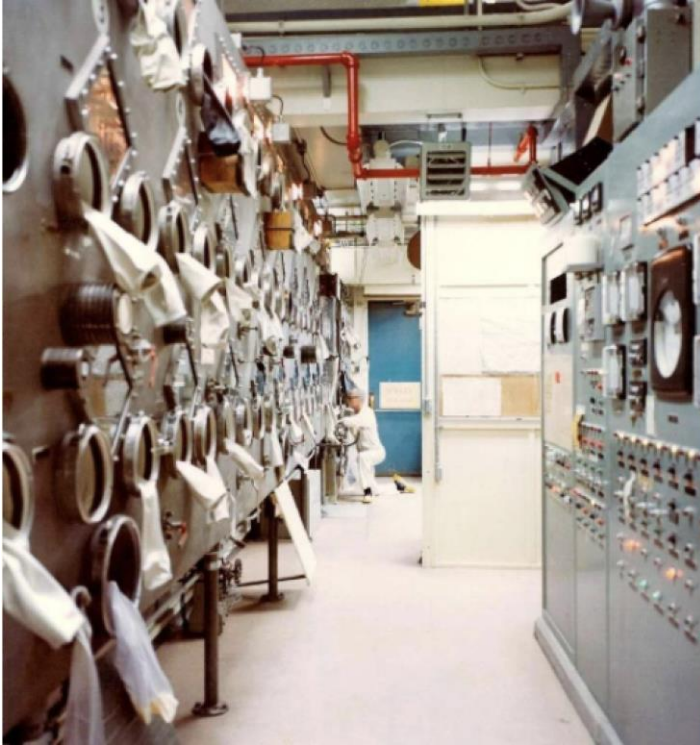


What is accurate? What is missing?

- Timeline should start 4 months before the event with the “industrial action” or strike which left the process in an abnormal condition
- Detailed standard operating procedures (SOP) probably lacking
- Event occurred at 2:25a (“graveyard” shift) which typically has less engineering and management supervision



McCluskey Room (1976)



What changed as a result of this event?



Summary of the event

- Chemical explosion in an ion exchange column within a glove box
- Ion exchange column loaded with 130 g (107MBq, 450 Ci) of ^{241}Am for 5 months
- Unrecognized buildup of hydrogen gas caused by radiolytic decomposition of the cation resin
- Restarting process by eluting with 7M HNO_3



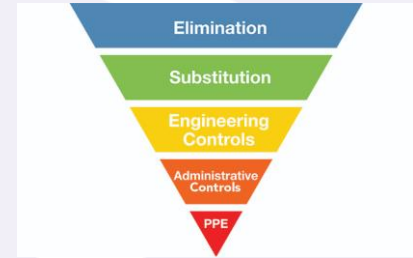
Worker treatment

- Chelation to remove Pu and Am
- Debriding to remove imbedded glass and plastic
- Radiation exposure to alpha and gamma emitters
- Contamination – set off nearby radiation detectors
- Contagious – continued to shed radioactive materials for the rest of his life



Process equipment and procedures

- Solvent extraction vs ion exchange
 - Continuous operation vs batch operation
- Resin design
 - Reillex HPQ specifically for high acid/high radiation environment
 - Glass column cage and pressure relief valve (PRV)
- Process operations
 - Maintain resin wet
 - Maintain resin in low acid
 - Limit time of radioactive material on the resin bed
 - Track the radiation exposure of the resin, replace on a cycle
 - Safe and stable configuration maintained



Process equipment and procedures



Questions?



